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Supporting Informations

Fig. S1 (A) In a PAN (100 μ M) solution, the value of Δ A changes with the addition of Zn²⁺ (final concentration: 0–120 μ M); (B) In the solution PAN-Zn²⁺ system, the value of Δ A changes with the addition of [CySH] (final concentration: 0–1000 μ M); (C) A possible mode of our indicator displacement assay.



Fig. S2 (A) The UV-vis absorption changes of the proposed IDA sensing with different transition metal ion; (B) Photographs of the proposed IDA sensing with different transition metal ion



Fig S3. (A) The A₅₇₀ nm UV-vis absorption changes of the proposed IDA sensing at different pH (The background of PAN-Zn²⁺ system were 100 μ M PAN and 50 μ M Zn²⁺). (B) The A₅₇₀ nm at different pH by corresponding histogram.



Fig. S4 (A) The UV-vis absorption changed containing PAN (100 μ M) in 0.1M sodium borate buffer solution (pH=10.0) at different Zn²⁺ concentration; (B) line chart at A₅₇₀ nm.



Fig. S5 The A_{570} nm changes of IDA sensing at different reaction time (The background of PAN-Zn²⁺ system were 100 μ M PAN and 50 μ M Zn²⁺).



Fig. S6 (A) The UV-vis spectrum of the proposed colorimetric sensor based on IDA strategy upon the addition of 500 μ M cysteine and different interferences (1500 μ M), respectively; (B) The selectivity depicted by corresponding histogram. Inset is the photography of the corresponding solution.



Fig. S7 (A) The UV-vis spectrum of the competitive selectivity; (B) Upon the addition of 500μ M cysteine and 1000μ M other amino acids in PAN-Zn²⁺ system at A_{570 nm}, respectively, 1= PAN-Zn²⁺, a=CySH, b=Thr, c=Val, d= Trp, e=Lys, f=Glu, g=Asp, h=Phe, i=Leu, j=Sar, k=Tyr, l=His, m= Ala, n= Gly; o=Arg; (C) The color changes of competitive selectivity of PAN-Zn²⁺ system toward cysteine in the presence of other amino acids in 0.1 M sodium borate buffer solution (pH=10.0).



Fig. S8 (A) Schematic diagram of device ; (B) Screenshots of the Android apps used to quantify a colorimetric test.



Fig. S9 (A) G value of calibration response based on IDA strategy for the determination of cysteine; (B) B value of calibration response based on IDA strategy for the determination of cysteine.

Sample	Added(µM)	Mean Found(µM)	Mean recovery%	RSD%	Mean Found by Amino acid analyzer (µM)
1	300	296.80	98.93	1.11	212.14
2	500	495.36	99.07	2.91	517.62
3	700	707.01	101.00	1.82	688.29

Table S1. Recovery results for amino acid injection of cysteine by the proposed method.

Method	Detection limit (M)	Linear range (M)	Ref.
UV-vis	1.0 × 10 ⁻⁶	4.0 × 10 ⁻⁶ -94.0× 10 ⁻⁶	30
UV-vis	$2.8 imes 10^{-4}$	3.2×10^{-6} - 8.2×10^{-6}	38
UV-vis	$8.0 imes10^{-6}$	0.02×10^{-6} - 2.0×10^{-6}	39
CV	1.76×10^{-4}	9.0×10^{-5} - 5.0×10^{-3}	40
CV	$1.5 imes 10^{-6}$	$5.0 imes 10^{-6} - 6.0 imes 10^{-5}$	41
CV	$1.0 imes10^{-6}$	$5.0 imes 10^{-6} - 6.85 imes 10^{-4}$	42
UV-vis	7.3 × 10 ⁻⁶	2.5×10^{-5} -1 × 10 ⁻³	This work

Table S2. Performance comparison of several CySH sensors.